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## Design and Implementation of Real-Time Estimation of Human Skin Elasticity and Hydration System Using ARM Controller

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#### **Abstract:**

Skin provides many functions critical to the human body, including regulation of body temperature and protection from water loss. The skin becomes drier, more wrinkled, and less resilient and spots and growths appear. Cuts and abrasions may heal more slowly. The presented paper focus on Skin functions critical to the human body, including regulation of body temperature and protection from water loss. The properties of skin related to these functions, primarily elasticity and hardness, are directly affected by chronological aging and photo-aging and vary among locations on the body over the Zigbee Wireless Sensor Network.

The ability to quantify these properties is important so the aged status of skin can be characterized for patients and skin healing therapies can be evaluated. Therefore, the intention of this project is to develop a tool to measure the stretching and indentation resistance of skin at various rates and size scales using pressure, LDR, temperature, heart beat and humidity sensors and activity by them always displayed on computer by using Zigbee-WSN technology. Doctors using this information give treatment to the patients in correct time.

#### Index terms:

Humidity, temperature, pressure, heart beat, LDR sensors, ARM-7 LPC2148 microcontroller.

#### **I.INTRODUCTION:**

Highly interaction in human machine in daily lives has made user interaction progressively very important. Expansion of sensor based advanced technology sophisticated human force and stress along with power conservation with automation system. Genetically programmed chronologic aging causes biochemical changes in collagen, elastin, and the connective tissues that give skin its firmness and elasticity. The genetic program for each person is different, so the loss of skin firmness and elasticity occurs at different rates and different times in one individual as compared with another. As skin becomes less elastic, it also becomes drier. Underlying fat padding begins to disappear. With loss of underlying support by fat padding and connective tissues, the skin begins to sag. It looks less supple, and wrinkles form. The controlling device of the whole system is a Microcontroller. The Microcontroller is programmed using Embedded C language.Simultaneously with genetically programmed aging, the process of photo aging may be taking place.

Photo aging is the effect of chronic and excessive sun exposure on the skin. Cigarette smoking also contributes to aging effects by the biochemical changes it brings about in skin tissues. Photo aging interacts with chronologic aging and appears to hasten the process of chronologic aging. In fact, photo aging may be responsible for the majority of age-associated changes in the skin's appearance. Although the skin provides a painless and compliant interface for systemic drug administration (dermal or transdermal delivery), it is also able to impede the ux of toxins into the body which means that it naturally has a very low permeability to the penetration of foreign molecules Determining the age of skin is important to the world of dermatology, it can be used to evaluate skin healing therapies. Currently, the most effective method is by taking a biopsy of the skin directly from the patient, which is obtrusive and discomforting to the patient, however provides no quantitative analysis of the skins condition.

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The objective of this project is to characterize the age of skin by designing a device to measure its hardness and elasticity. Skin consists of two main layers: the dermis and epidermis. The dermis is the inner layer of skin that contains nerve fibers, fat cells, blood vessels, sweat and oil glands, and hair follicles. The dermis also contains collagen and elastin, two proteins that are responsible for the structure and elasticity of the skin itself. Both of these proteins are subject to the process of aging. The epidermis is the outermost layer of the skin. New cells generated by the dermis continually replace this layer. The epidermis also contains melanocytes or pigment cells. These cells produce melanin, which determines the shade of the skin.

#### **II. RELATED WORK:**

The idea behind the proposed system is to determine its properties of skin analysis using pressure, LDR, temperature, heart beat and humidity sensors were displayed on to the PC using wireless zigbee communication. The transmitter section of the system consists of an ARM Micro controller, which is interfaced with the pressure sensor, humidity sensor, and Zigbee, LCD output modules, the controller acts as an intermediate medium between both of them. So the controller can be termed as a controller. These sensors are arranged on patient's body to get skin pressure and humidity information. Zigbee transmitter transmits data received from the controller. Zigbee receives the information from transmitter of patient information displayed on PC through RS232 cable. The corresponding data also displayed on LCD.

An embedded system is a combination of software and hardware to perform a dedicated task. Some of the main devices used in embedded products are Microprocessors and Microcontrollers. Microprocessors are commonly referred to as general purpose processors as they simply accept the inputs, process it and give the output. In contrast, a microcontroller not only accepts the data as inputs but also manipulates it, interfaces the data with various devices, controls the data and thus finally gives the result. Our skin is the largest organ in our body. It is our outer covering, and is responsible for many functions, including the protection of our bodies from the outside world. However, it is not just a functional layer. Our skin appearance is important in conveying a healthy appearance, and is often a reaction of one's health and age. These are reasons why one should endeavor to improve the quality of their skin. Some people's skin may be problematic at times, requiring specific treatments, whilst others have no problems, and simply wish to improve the quality of their skin. Analysis of skin is the first step in improving one's skin. There are various skin types, not all of which are problematic, but each can be improved on by matching the correct treatment/skin care to each skin type.

Our doctors specialize in skin analysis and can help you to determine what your skin type is, and how to best treat it. They can also determine if there is a medical condition that may be causing problems with the skin. For example, redness of the cheeks may be caused by medical conditions such as Lupus, certain medications, or rosacea. Secondly, a skin history needs to be determined. A person's current regime of skin care needs to be assessed to see if this is causing any problems with their skin. Especially in Australia, a sun exposure history needs to be assessed, and whether the person has used sunscreen regularly. As an aside note, we recommend that sunscreen is used on a daily basis, regardless of the amount of sun exposure you receive. Thirdly, your skin type needs to be assessed as each skin type will require a different type of treatment. Your skin type in conjunction with any problems present will determine

# III.HARDWARE DESIGN OF PROPOSED SYSTEM:

In this paper we presented an advanced wireless sensor network for skin analysis using wireless zigbee communication along with PC and ARM-7 LPC 2148 microcontroller. Zigbee based remote skin parameters monitoring system that transmits the wireless signals according to the sensors output to the Microcontroller and further for analysis we store in the PC using wireless zigbee communication network. The sensors relevant sensed data received will be fed as input to Microcontroller. The controller processes the data and transmits to the PC monitoring section wirelessly. The micro controller is also interfaced with few LED indicators to provide the health status of the device. The proposed working model of the system consists of two sections mentioned below-best course of treatment.

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PC Based Skin Analyzer is a compact skin analyzer featuring touch screen operation making daily use easy and intuitive. PC Based Skin Analyzer easily integrates into the daily work routine, where it may provide supplementary scientific evidence in support of visual assessment of skin conditions, whether it is in a beauty clinic or salon. As such, the device is ideal for evaluating photo aging and the collagen improvement as a result of rejuvenating procedures as well as the recommendation of specific skin care products. It is based on our long-term experience in developing and manufacturing scientific skin instrumentation. In this possible to combine the classical topical measurements with high resolution cross-sectional in-depth imaging in one single instrument .







The transmitter or sensor section comprises of ARM-7 LPC2148 microcontroller interfaced with sensors like LDR, humidity, temperature, heart beat, and pressure sensors. Zigbee is a PAN technology based on the IEEE 802.15.4 standard.

Unlike Bluetooth or wireless USB devices, Zigbee devices have the ability to form a mesh network between nodes. Meshing is a type of daisy chaining from one device to another. This technique allows the short range of an individual node to be expanded and multiplied, covering a much larger area.

#### Sensor-1:

Heart beat monitor and display system is a portable and a best replacement for the old model stethoscope which is less efficient. The heart beat rate is calculated manually using stethoscope where the probability of error is high, because the heart beat rate lies between 70 to 90 per minute whose occurrence is less than 1 sec. So this device can be considered as a very good alternative instead of a stethoscope. The present sensor monitors the heart rate and human emotions/mood (angry, normal, scared, tens, tired).

#### Sensor-2:

In our project we are using Light Dependent Resistance to detect the sunlight Light intensity; it is a special type of resistance whose value depends on the brightness of light, which is falling on it. It has resistance of about 1mega ohm when in total darkness, but a resistance of only about 5k ohms when brightness illuminated. It responds to a large part of light spectrum. A photo resistor or light dependent resistor or cadmium sulfide (CdS) cell is a resistor whose resistance decreases with increasing incident light intensity. It can also be referenced as a photoconductor. This sensor monitors the sunlight intensity using which the skin burns can be analyzed the Skin color.

#### Sensor-3:

Humidity sensors detect the relative humidity of the immediate environments in which they are placed. They measure both the moisture and temperature in the air and express relative humidity as a percentage of the ratio of moisture in the air to the maximum amount that can be held in the air at the current temperature. As air becomes hotter, it holds more moisture, so the relative humidity changes with the temperature. This sensor monitors the values of Humidity in percentage and skin type also (normal, dry, oily).

#### Sensor-4:

The LM35 sensor series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. To detect the heat produced during fire occurrence we use temperature sensor.

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The present sensor can monitor the different skin sensing heat at time of different moods.

#### Sensor-5:

A pressure sensor measures pressure, typically of gases or liquids. Pressure is an expression of the force required to stop a fluid from expanding, and is usually stated in terms of force per unit area. A pressure sensor usually acts as a transducer; it generates a signal as a function of the pressure imposed. For the purposes of this article, such a signal is electrical. This sensor can monitor the values of that Pressure (assume the age of human skin)

#### **Receiver or Monitoring section:**

Design And Implementation of Real-Time Estimation of Human Skin Elasticity and Hydration system using ARM Controller 2.Receiver



Fig-1: Block diagram of receiver section of the proposed model

#### **b.**Monitoring or PC section:



Fig-3: HyperTerminal window on monitor

In the remote monitoring section of the proposed system we interface the zigbee module directly to PC for monitoring the sensors data of skin analysis using RS232 cable and MAX 232 is a chip which converts the voltage level from TTL levels to RS 232 levels or vice versa. When communicating with various micro processors one needs to convert the RS232 levels down to lower levels, typically 3.3 or 5.0 Volts.

The remote controlling section consists of PC, zigbee transceiver module and a battery for the module to enable. User needs to follow the steps to connect hyper terminal of the PC.START—All Programs—Accessories—Communications—Hyper Terminal—now the user should can enter a suitable name for his/her hyper terminal (Ex-abc)—now needs to select com port (generally COM1) —one dialogue box gets opened—need to enable the restore setting button to select the properties of select communication—hyper terminal window gets connected.Connect a zigbee module at the com port of PC using DB-9 Serial RS-232cable.

#### **IV.CONCLUSION:**

An existing remote skin parameters monitoring using wireless zigbee was designed such that the sensors data base from pressure, LDR, humidity, temperature, heart beat sensors and the system wirelessly monitors using Zigbee technology. This system can be extended using GSM. The GSM module will send the information regarding the status of skin analysis to the respective doctors directly. The dry properties of skin can be measured using the Moisture Content module and probe. Dry patches can be measured using the electrical conductivity of the skin surface as compared to normal skin.

Values in the range 0-99 can be measured before, during and after moisturize treatments. Measurement of hydration Corneometer measures the stratum corneum hydration state. This measurement is based on differences in dielectric constants of water and other substance where the capacitor would show the capacitance changes based on moisture content of samples measures. During the measurement, there will be an electric scattereld penetrating the skin and the dielectricity will be determined. \_ Useful for evaluating moisturizers and cleansers enditemize.



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To obtain measurements of skin surface impedance to determine electro conductivity of the treatment sites. This meter provides a relative measure of the retained water content of the skin as a function of the skin's dielectric value. Skin impedance is recorded automatically when equilibrium is achieved..

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